Data Sheet No. PD-3.178

INTERNATIONAL RECTIFIER IOR

T-25-15

40RIF, 50RIF SERIES

63A, 80A RMS Medium Power Fast Turn-off Thyristors

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Major Ratings and Characteristics

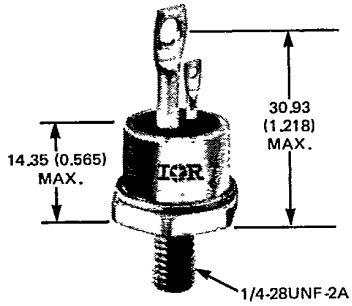
		40RIF	50RIF	Units
$I_{T(AV)}$ @ T_C		40	50	A
		85	85	°C
I_{TSM}	50Hz	700	1000	A
	60Hz	733	1047	A
I^2t	50Hz	2450	5000	A^2s
	60Hz	2237	4564	A^2s
$I^2\sqrt{t}$		34648	70711	$A^2\sqrt{s}$
t_q range		10 to 40		μs
V_{RRM} range		100 to 1200		V
T_J		–40 to 125		°C

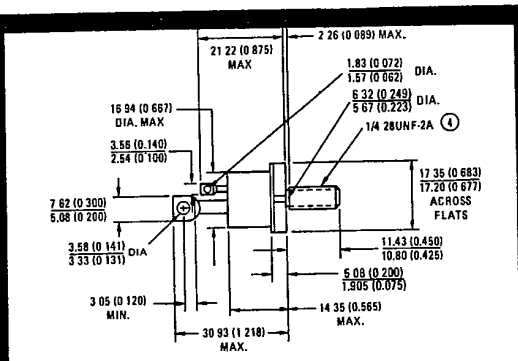
Description/Features

The 40RIF and 50RIF series of fast turn-off thyristors are suitable for applications such as inverters, switch mode power supplies and choppers.

- Fully characterised data.
- High surge capability.
- Available up to 1200V V_{DRM}, V_{RRM}.
- Turn-off time as short as 10μs.

CASE STYLES AND DIMENSIONS





All Dimensions in Millimeters and (Inches)

40RIF, 50RIF Series

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ELECTRICAL SPECIFICATIONS

Voltage ratings

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Part number		V_{RRM}, max. repetitive peak reverse voltage $V_g \leq 0$	V_{RSM}, max. non-repetitive peak reverse voltage $t_p \leq 5$ ms	V_{DRM}, max. repetitive peak off-state voltage, gate open circuited	I_{RM}, I_{DM}, max. peak reverse and off-state leakage current at rated V_{RRM}, V_{DRM}, $T_J = 125^oC$, gate open circuited
		V	V	V	mA
40RIF10W..	50RIF10W..	100	150	100	15
40RIF20W..	50RIF20W..	200	300	200	15
40RIF40W..	50RIF40W..	400	500	400	15
40RIF60W..	50RIF60W..	600	700	600	15
40RIF80W..	50RIF80W..	800	900	800	15
40RIF100W..	50RIF100W..	1000	1100	1000	15
40RIF120W..	50RIF120W..	1200	1300	1200	15

Forward Conduction

		40RIF	50RIF	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	40	50	A	180° conduction, half-sine wave, $T_C = 85^oC$		
$I_{T(RMS)}$	Max. continuous RMS on-state current	63	80	A			
I_{TSM}	Max. peak, one cycle non-repetitive on-state current	700	1000	A	t = 10ms	100% rated V_{RRM} reapplied	Sinusoidal half-wave. Initial $T_J = 125^oC$.
		733	1047	A	t = 8.3ms		
		832	1189	A	t = 10ms	No voltage reapplied	
		871	1245	A	t = 8.3ms		
I^2t	Max. I^2t capability for fusing	2450	5000	A^2s	t = 10ms	100% rated V_{RRM} reapplied	Initial $T_J = 125^oC$.
		2237	4564	A^2s	t = 8.3ms		
	Max. I^2t for individual device fusing	3465	7071	A^2s	t = 10ms	No voltage reapplied	
		3163	6455	A^2s	t = 8.3ms		
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ capability for individual device fusing	34,648	70,711	$A^2\sqrt{s}$	t = 0.1 - 10ms, no voltage reapplied		
V_{TM}	Max. peak on-state voltage	2.40	2.0	V	$T_J = 25^oC$, 180° conduction, $I_{TM} = \pi$ x rated $I_{T(AV)}$		
di/dt	Max. non-repetitive rate-of-rise of turned on current	200		A/μs	600V	$T_J = 125^oC$.	
		180		A/μs	800V	I_{TM} = 2 x rated di/dt, I_g = 250mA, $t_r \leq 9{,}5$ μs.	
		160		A/μs	1000V	For repetitive value use 40% non-repetitive.	
		150		A/μs	1200V	Per JEDEC standard RS-397, 5.2.2.6.	
$V_{T(TO)}$	Max. value of threshold voltage	1.463	1.310	V	$T_J = 125^oC$		
r_T	Max. value of on-state slope resistance	6.49	4.19	mΩ			
I_H	Max. holding current	200		mA	$T_J = 25^oC$, anode supply = 6V, resistive load, gate open circuit		
I_L	Max. latching current	400		mA	$T_J = 25^oC$, anode supply = 6V, resistive load		

Triggering

P_{GM}	Max. peak gate power	10	W	$t_p \leq 5$ms	
$P_{G(AV)}$	Max. average gate power	2.5	W		
I_{GM}	Max. peak gate current	5.0	A	$t_p \leq 5$ms	
$-V_{GM}$	Max. DC peak negative gate voltage	10	V		
V_{GT}	Max. DC gate voltage required to trigger	4.0	V	$T_J = -40^oC$	Anode supply = 6V resistive load
		2.5	V	$T_J = 25^oC$	
		1.5	V	$T_J = 125^oC$	
I_{GT}	Max. DC gate current required to trigger	250	mA	$T_J = -40^oC$	Anode supply = 6V resistive load
		150	mA	$T_J = 25^oC$	
		80	mA	$T_J = 125^oC$	

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Triggering (continued)

V_{GD}	Max. DC gate voltage that will not trigger	0.2	V	T_J = 125°C, rated V_{DRM} applied
I_{GD}	Max. DC gate current that will not trigger	5.0	mA	T_J = 125°C, rated V_{DRM} applied

Switching

$t_d + t_r$	Typical turn-on time	0.9	µs	T_J = 125°C, V_D = 0.8 rated V_{DRM}, I_{TM} = $I_{T(AV)}$, resistive load I_g = 250mA, $t_r < 0.5$ µs, $t_p > 6$ µs
t_q	Max. turn-off time	see separate table		

Blocking

dv/dt	Min. critical rate-of-rise of off-state voltage	500	V/µs	T_J = 125°C, exponential to 0.67 rated V_{DRM}, gate open circuit

THERMAL AND MECHANICAL SPECIFICATIONS

			40RIF	50RIF	Units	Conditions
T_J	Junction operating temperature range		−40 to 125		°C	
T_{stg}	Storage temperature range		−40 to 150		°C	
R_{thJC}	Maximum thermal resistance junction to case		0.35		K/W	DC Operation
R_{thCS}	Maximum thermal resistance case to heatsink		0.25		K/W	Mounting surface flat, smooth and greased
T	Mounting torque ± 10%	to nut	20(27.5)		lbf-in	Lubricated (non-lubricated) threads
			0.23(.32)		kgf-in	
			2.3(3.1)		N-m	
		to device	25		lbf-in	
			0.29		kgf-in	
			2.8		N-m	
wt	Approximate weight		1.0		oz	
			28		g	
	Case style		TO−208AC(TO-65)			JEDEC

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MAXIMUM TURN-OFF TIME TABLE

tq	Units	t_q code	max. V_{DRM}, V_{RRM}	Conditions
10	µs	10	600V	T_J = 125°C, I_{TM} = rated $I_{T(AV)}$ for ≥ 200 µs, −dI/dt = 10A/µs, V_R = 100V, reapplied dv/dt = 200V/µs exponential to 0.67 rated V_{DRM}
15	µs	15	600V	
20	µs	20	1000V	
40	µs	40	1200V	

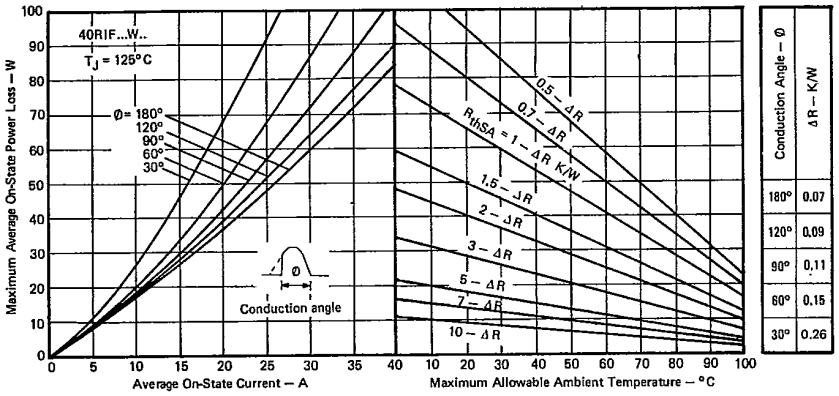

Fig. 1 – Current Ratings (Sinusoidal Waveforms, 50–400 Hz), 10RIF Series.

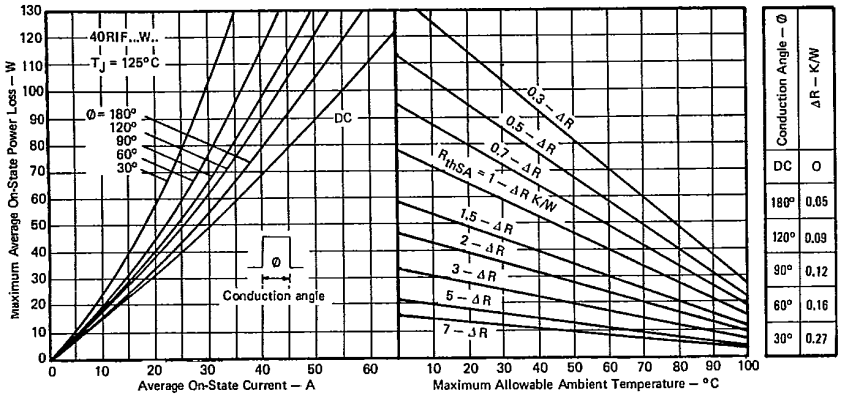

Fig. 2 – Current Ratings (Sinusoidal Waveforms, 50–400 Hz), 40RIF Seiries.

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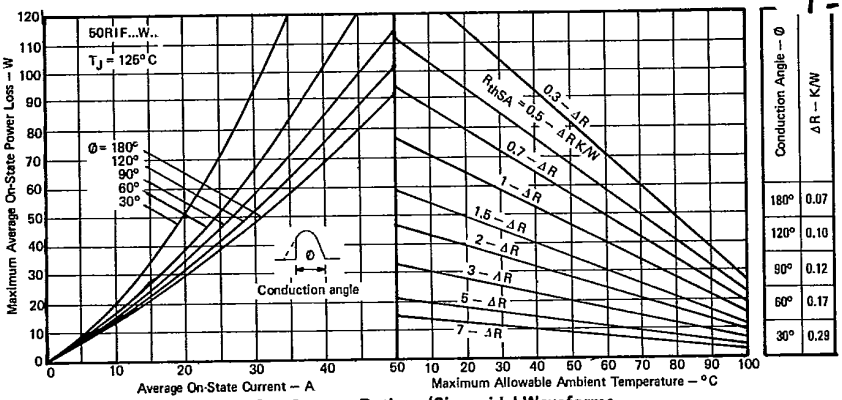

Fig. 3 – Current Ratings (Sinusoidal Waveforms, 50–400 Hz), 50RIF Series.

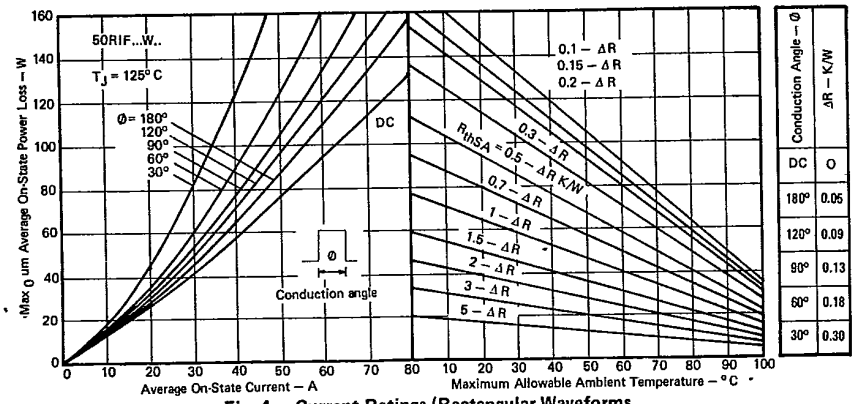

Fig. 4 – Current Ratings (Rectangular Waveforms, 50–400 Hz), 50RIF Series.

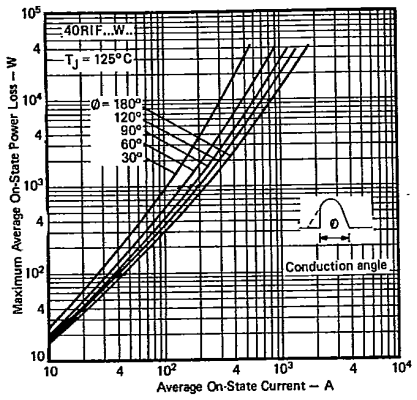

Fig. 5 – High Level Power Loss Characteristics – Sinusoidal Current Waveform), 40RIF Series.

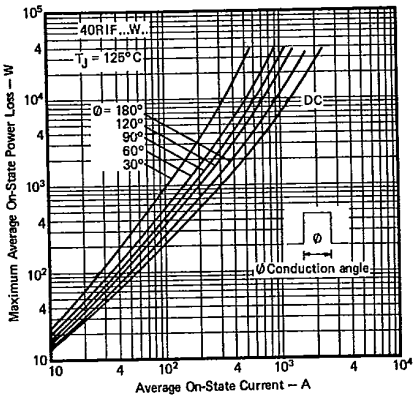

Fig. 6 – High Level Power Loss Characteristics – (Rectangular Current Waveform), 40RIF Series.

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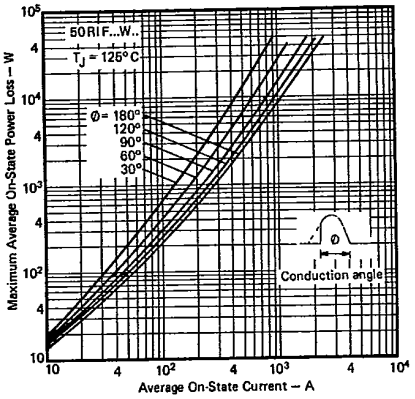

Fig. 7 – High Level Power Loss Characteristics – (Sinusoidal Current Waveform), 50RIF Series.

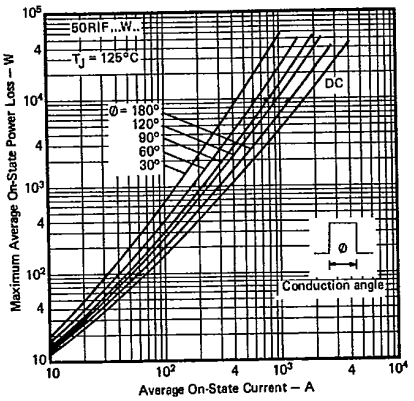

Fig. 8 – High Level Power Loss Characteristics – (Rectangular Current Waveform), 50RIF Series.

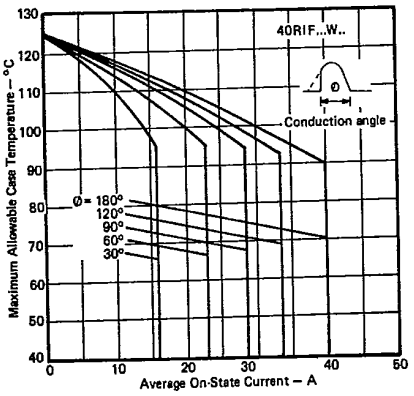

Fig. 9 – Case Temperature Ratings – (Sinusoidal Current Waveform), 40RIF Series.

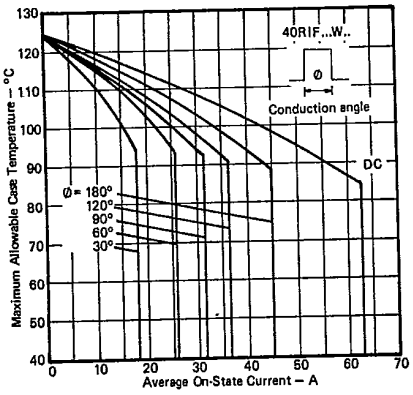

Fig. 10 – Case Temperature Ratings – (Rectangular Current Waveform), 40RIF Series.

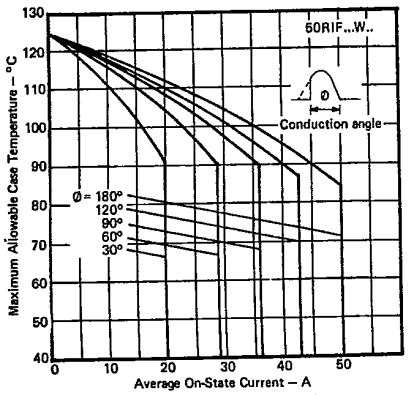

Fig. 11 – Case Temperature Ratings – (Sinusoidal Current Waveform), 50RIF Series.

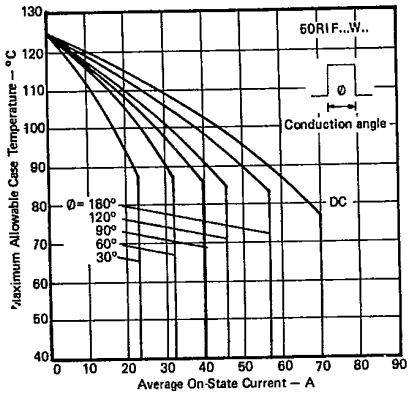

Fig. 12 – Case Temperature Ratings – (Rectangular Current Waveform), 50RIF Series.

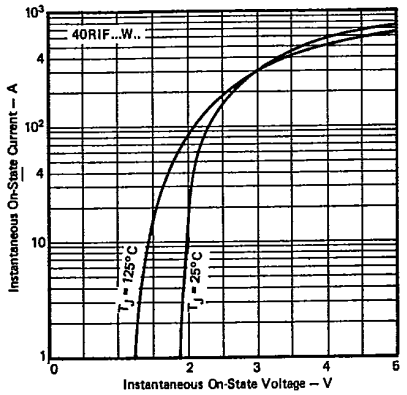

Fig. 13 – On-State Characteristics, 40RIF Series.

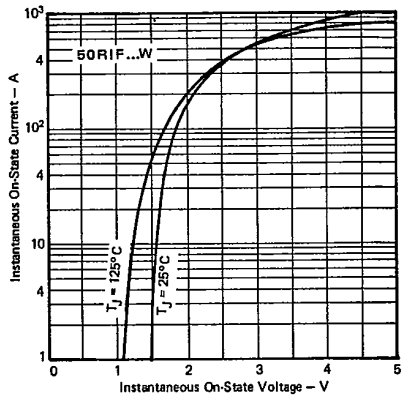

Fig. 14 – On-State Characteristics, 50RIF Series.

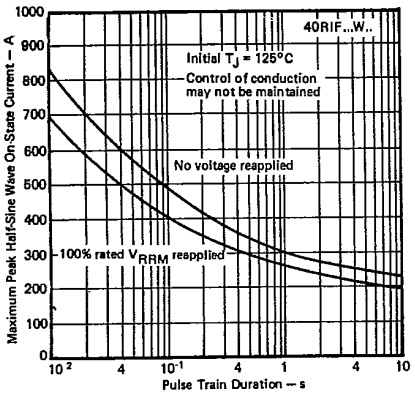

Fig. 15 – Non-repetitive Surge Ratings, 40RIF Series.

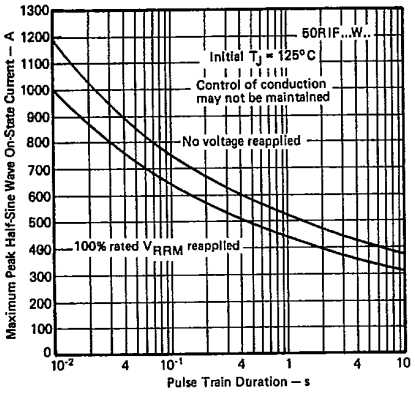

Fig. 16 – Non-repetitive Surge Ratings, 50RIF Series.

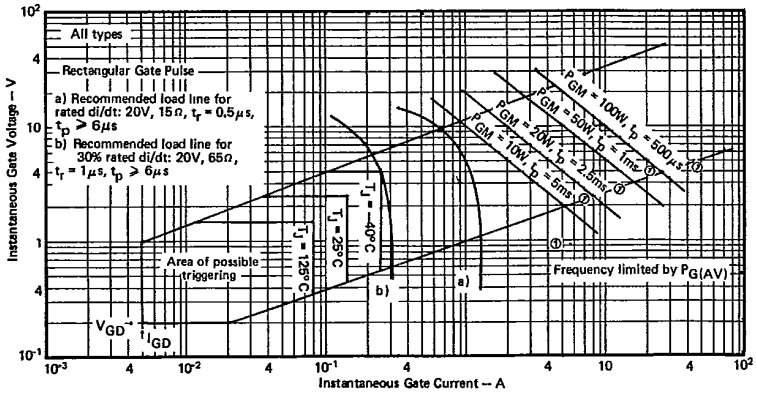

Fig. 17 – Gate Characteristics, All Series.

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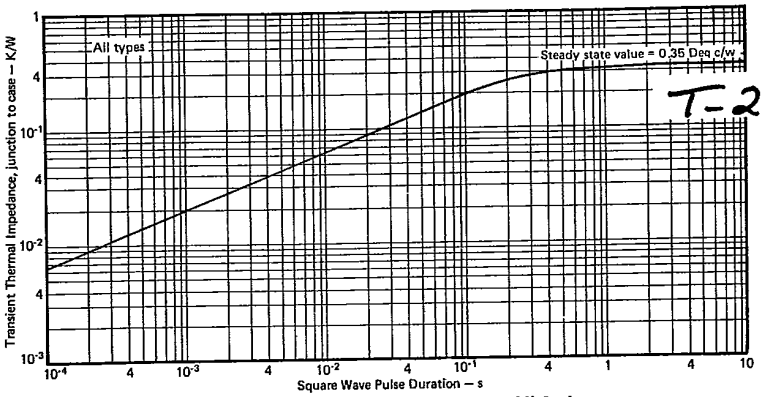

Fig. 18 – Transient Thermal Impedance, All Series.

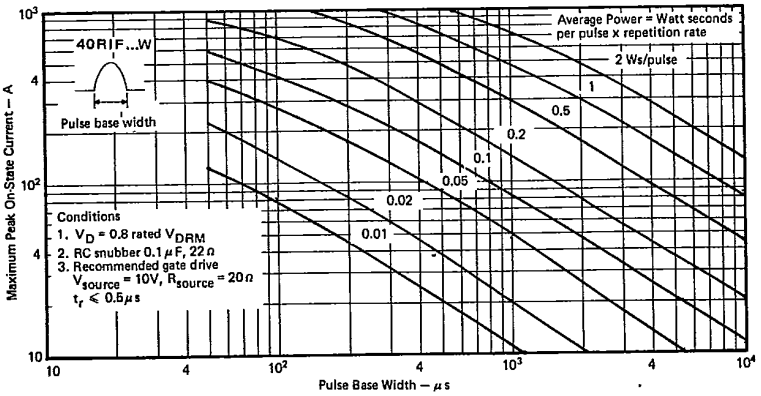

Fig. 19 – Energy Loss per Pulse Characteristics – (Sinusoidal Current Waveform), 40RIF Series.

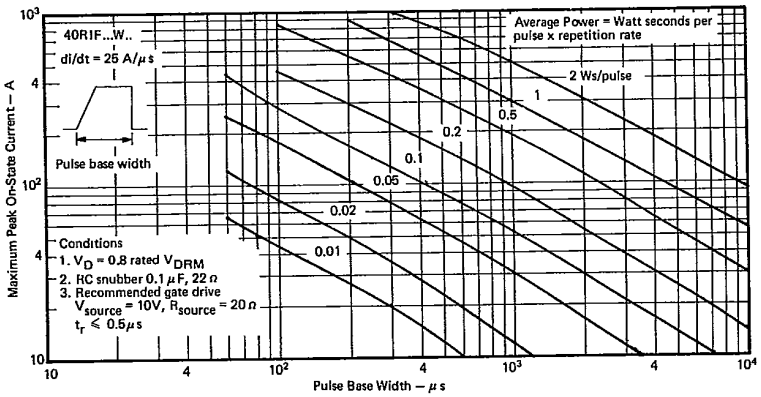

Fig. 20 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform), 40RIF Series. di/dt = 25A/μs.

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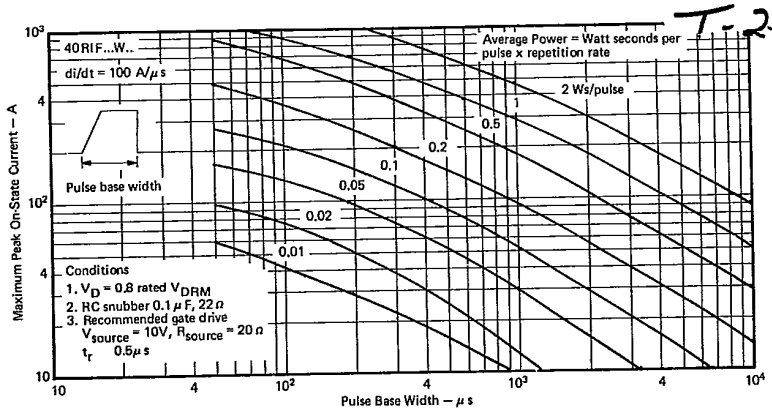

Fig. 21 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform), 40RIF Series. di/dt = 100A/μs.

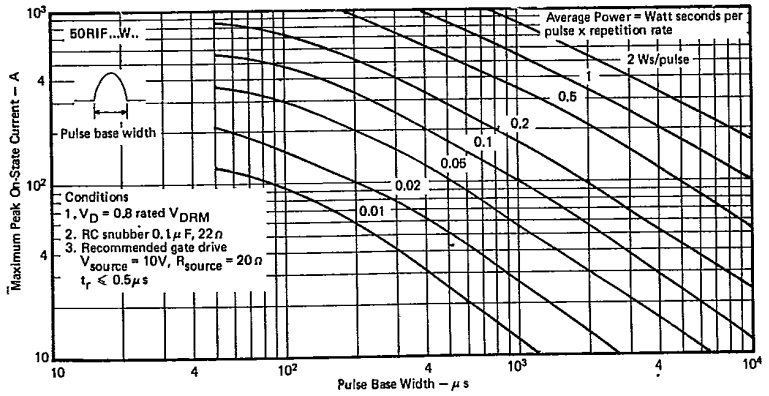

Fig. 22 – Energy Loss per Pulse Characteristics – (Sinusoidal Current Waveform), 50RIF Series.

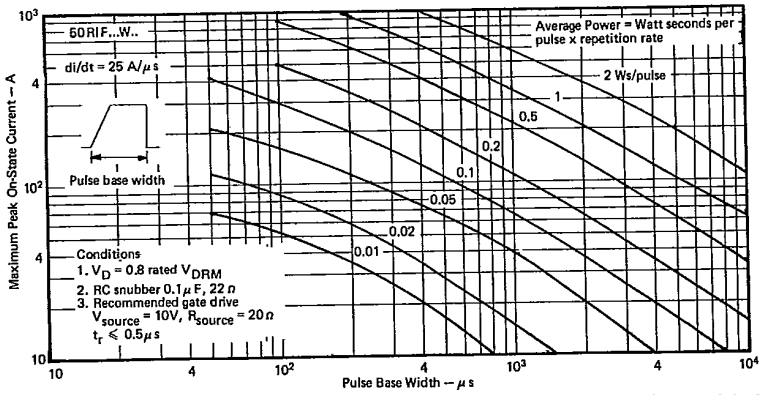

Fig. 23 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform), 50RIF Series. di/dt = 25A/μs.

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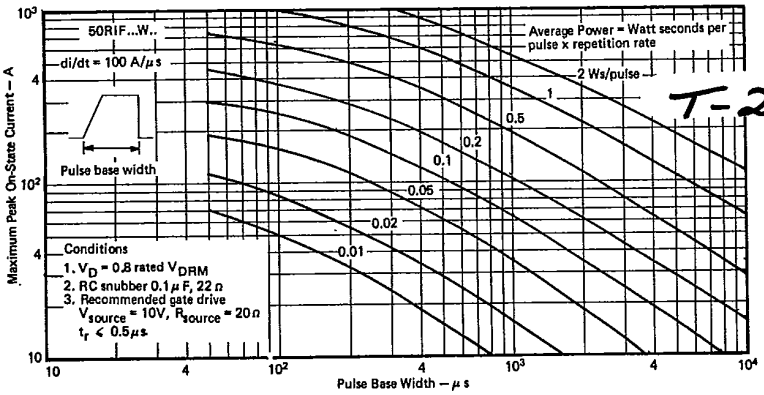

Fig. 24 – Energy Loss per Pulse Characteristics – (Trapezoidal Current Waveform), 50RIF Series. di/dt = 100A/μs.

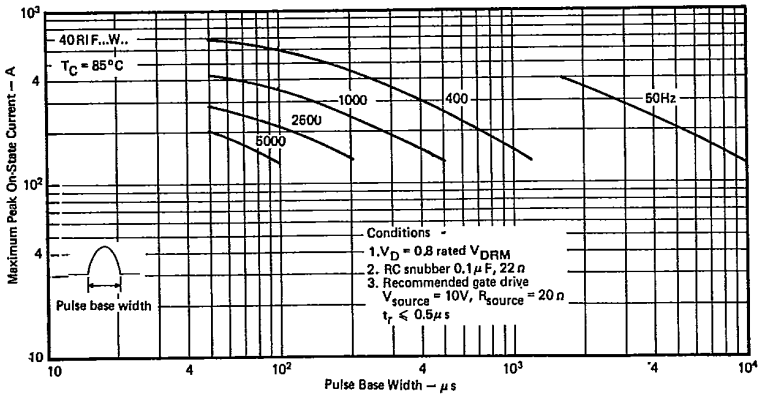

Fig. 25 – Peak On-State Current Vs. Pulse Width – (Sinusoidal Current Waveform), 40RIF Series.

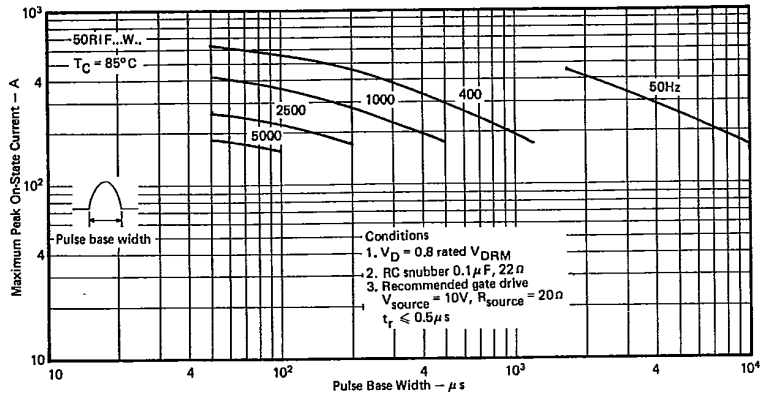

Fig. 26 – Peak On-State Current Vs. Pulse Width – (Sinusoidal Current Waveform), 50RIF Series.

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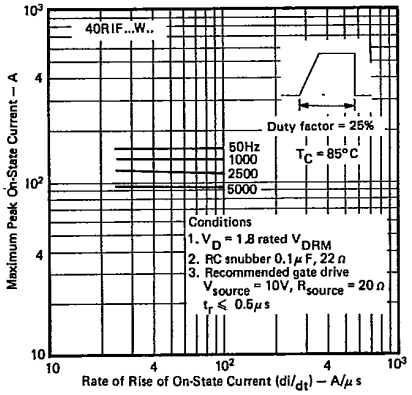

Fig. 27 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform), 40RIF Series. Duty Factor = 25%.

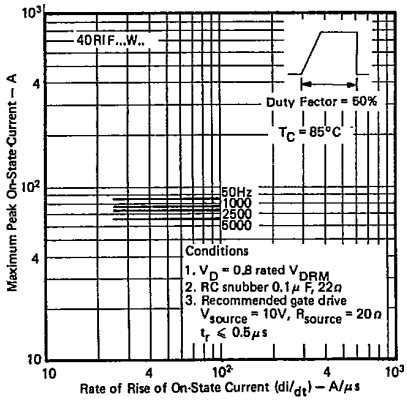

Fig. 28 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform), 40RIF Series. Duty Factor = 50%.

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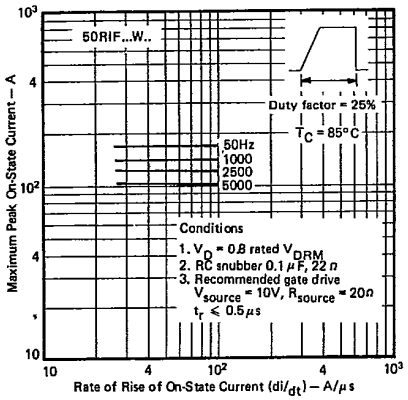

Fig. 29 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform), 50RIF Series. Duty Factor = 25%.

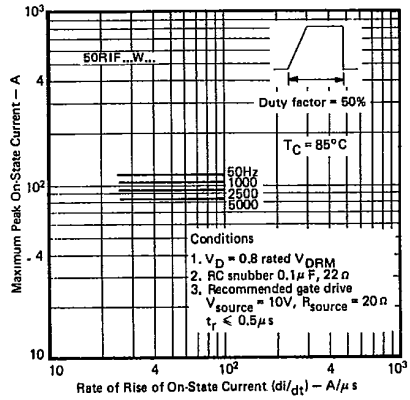

Fig. 30 – Peak On-State Current Vs. di/dt (Trapezoidal Current Waveform), 50RIF Series. Duty Factor = 50%.

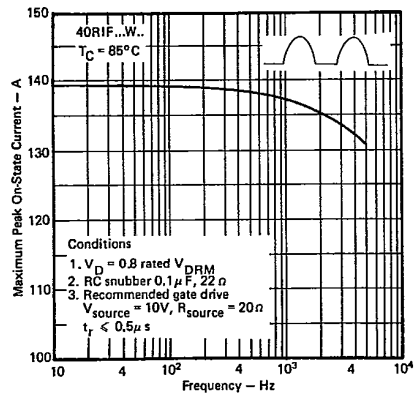

Fig. 31 – Peak On-State Current Vs. Frequency (Sinusoidal Current Waveform), 40RIF Series.

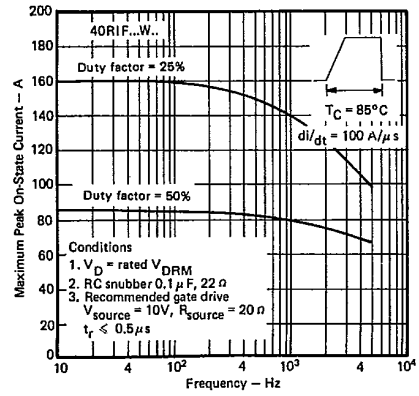

Fig. 32 – Peak On-State Current Vs. Frequency (Trapezoidal Current Waveform), 40RIF Series.

Fig. 33

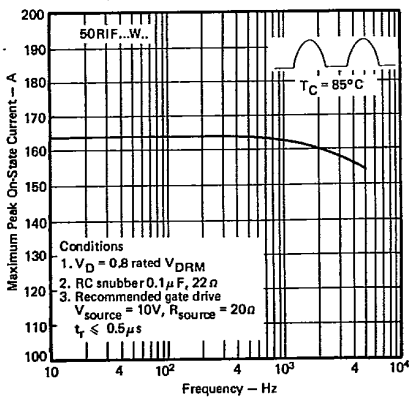

Fig. 33 – Peak On-State Current Vs. Frequency (Sinusoidal Current Waveform), 50RIF Series.

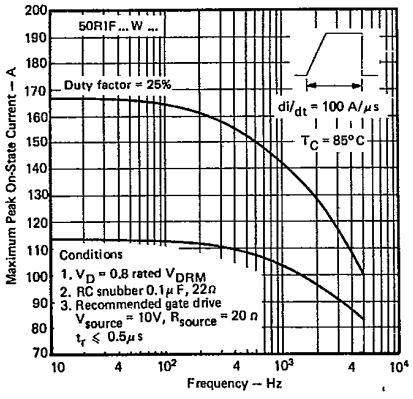

Fig. 34 – Peak On-State Current Vs. Frequency (Trapezoidal Current Waveform), 50RIF Series.